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The Mycorhizae of Aplectrum.*

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In April, 1876, Mr. H. Gilman collected a specimen of *Aplectrum spicatum* near Detroit, Mich., which he described in the Bulletin of the Torrey Botanical Club, 6 : 94. 1876, as being furnished with coralloid roots, and as parasitic on the roots of trees. The specimens was sent to Dr. Gray, who informed Mr. Gilman that such formations were "indeed unexpected," and the matter rested.

I have recently rediscovered this formation on a clump of plants near Lake Minnetonka, and my preliminary examination reveals much of interest concerning this variation in form, as well as some important facts concerning the general biology of the typical plant.

The normal plant of *Aplectrum* consists of a small compressed globose corm bearing a single flower stalk in May, and a leaf arising in August persistent throughout the winter. The corm gives off one or two lateral offshoots, upon the ends of which daughter corms arise, repeating the history of the parent corm.

The plant lives in humus, and it appears that it must be considered a hemi-saprophyte, both from anatomical and experimental evidence, although work upon this point is not complete.

The short straight unbranched roots are from ten to sixteen in number, and arise from the lower part of the corm. These organs entertain two fungi in such manner as to form an ectotropic and an endotropic mycorhiza. The endotropic fungus forms masses of hyphae nearly filling the greater number of the cortical cells of the root, and sending single filaments out through the root hairs into the humus soil. The nuclei of the cortical cells containing the fungus are very large and hyperchromatic, and it is evident that the fungus is beneficial to the tissue inhabited by it. Its general arrangement resembles that of the underground stems of *Corallorhiza*.

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*Preliminary notice read before the Indiana Academy of Science, December 30, 1897.

The brown hyphae from the mycorhiza of neighboring trees adhere and penetrate the epidermis of the roots in patches in such manner as to make it appear that the *Aplectrum* is parasitic upon the trees as suggested by Mr. Gilman. I find, however, that the fungus simply adheres to the roots of both plants and that the *Aplectrum* is parasitic upon the tree only in the remote sense that it is a competitor for the organic substances absorbed by the fungal symbiont from the soil. This last named fungus forms complete coatings on the roots of oaks and maples and penetrates the soil in every direction, adhering to the roots of *Aplectrum* when these are met.

The variation in the species, which forms the chief interest of this paper, is due to the manner in which the endotropic fungus is transmitted from the parent to young plants through the offshoots.

The offshoot is usually a cylindrical smooth stem 1–2 cm. in length, consisting of about three internodes. The cortical cells in normal plants are seen to be filled with the hyphal masses increasing in number from the apical end of the offshoot toward the younger plant. Since no trichomes are present, the hyphae do not pass outwardly and into the soil. An examination near the base of the offshoot on the lower side reveals a small clump of hairs which are directed downward and toward the roots of the parent plant. The fungus in these roots sends hyphae out into the soil, which, meeting the clump of hairs on the offshoot, penetrate through them into the cortical tissues, thence penetrating the offshoot lengthwise to the apex, passing into the roots of the young plant directly, since these organs arise from the apex of the offshoot. By this arrangement the fungus is confined to the absorbing organs and does not gain access to the storage tissues of the corm.

Now, it is to some disturbance in the relations of the fungus in transit through the offshoot that the coralloid formations are due. In such instance the offshoot develops numerous branches consisting of a relatively large number of internodes. The epidermis has developed an enormous number of trichomes resembling root hairs. The fungus sends hyphae out through these hairs and it is to be seen that the offshoot has been converted into an absorbing organ quite similar in structure and appearance to the underground stems of *Corallorhiza*. Other anatomical indications of the change in function are to be found.

It is, of course, readily apparent that, if these structural relations are transmissible, we have here a method by which *Aplectrum* may easily pass from a hemi-saprophyte into a complete dependence upon organic food with loss of chlorophyl. The writer will report further upon various anatomical and ecological features of the plant as soon as experiments now in progress are completed.